PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improvements relating to Flexible Containers for Liquids and to Fitment Mountings therefor

We, FIREPROOF TANKS LIMITED, a British Company, of Armadores House, Bury Street, London, E.C.2, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention is concerned with attachments for fittings at the apertures of flexible containers for liquids and may be applied in particular to flexible fuel tanks for air, land and sea borne vehicles. Such tanks are usually made from flexible sheeting of plastic material, natural or synthetic rubber or similar material, either reinforced or not, with woven or like fabric.

The invention is concerned with the attachment of fittings, such for example as inlet and outlet unions, gauge fittings, air vents, inspection covers and the like which are usually formed from rigid material and are preferably detachable and must form leak proof joints with the container.

Hitherto there have been two accepted methods of fixing such fittings. In the first method the material was clamped around the apertures in the wall of the container, reinforced locally where necessary, between rigid members which are usually flat rings in contact with the inside and outside of the container wall. The fittings are attached to one of these rings by means of bolts. In the second method, to the walls of the fluid containers, which may be locally reinforced if necessary, is cemented a rigid ring completely or partly embedded in a plastic or rubber-like material. The studs or bolts which locate the fitting have one end located in the ring. Means are provided for replacing the studs or bolts, should they become worn or damaged.

Both of these methods suffer from certain disadvantages. Thus, in the first method, the fact that the sheeting material of which the container is made is plastic or resilient causes that part of the material which is located between the clamping rings to be deformed under pressure and to develop plastic flow, especially under tropical conditions. This will result in leakage near the fittings upon reduction of stress in the joints. Also, the unclamped portion of the flexible material of the container immediately adjacent the clamping rings may tend to chafe or fret due to concentration of stress if the assembly is subjected to vibration or fluctuating loading. Furthermore, with this method of attachment, leakage is apt to arise along the clearance within the threads of the bolts or studs used for clamping, unless great care is taken to replace worn or defective sealing washers under the heads of these bolts or studs. Yet again, should one of the bolts or studs used to secure the fitting break off, it is difficult to remove the broken stud and such repair probably necessitates the removal of the complete clamping ring assembly from the container.

The second method, although an improvement on the first, also suffers from some disadvantages. Thus, the rigid ring which is embedded or moulded in a plastic or rubber-like material is cemented on to the container wall. Should this ring become distorted or otherwise damaged during service, its replacement is a matter of some difficulty and necessitates special

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equipment such as cements and heat vulcanisers. Removing the faulty ring from the container wall may cause damage to the aforesaid container walls. Furthermore, when cementing the moulded ring to the container wall, special clamping devices have to be used so as to secure good adhesion. This is especially the case when the container walls are made from uncured natural or synthetic rubbers and subsequently heat vulcanised. During vulcanisation, rubber has a tendency to shrink and pull away from the moulded ring. Also the moulded rings are liable to be heavy and add considerable weight to liquid containers.

The object of the present invention is to provide a form of attachment for such fittings to flexible containers which obviates the afore-mentioned disadvantages, and thus enables a flexible container to be produced which will remain liquid-tight under adverse conditions of temperature and vibration, permit easy replacement during service of broken or damaged bolts, studs or rigid ring, without the penalty of undue weight or special repair equipment.

In such containers, according to our present invention, the apertures are provided with a resilient outstanding neck having an external annular channel in which is located a rigid ring provided with spaced holes, whose axes are substantially parallel to the ring axis, in each of which one end of a stud or bolt may be secured, the end of the neck remote from the container wall having complementary holes through which the studs or bolts may be passed to secure a fitment in position. Naturally, the rigid ring has smooth edges so as not to cut or cause any other sort of damage to the parts of the neck with which it is in contact, and if desirable, it can be partly or completely embedded in a plastic or rubber-like material.

Conveniently, the holes in the rigid ring are plain and the ring is shaped to hold the bolt heads, or nuts at one end of the studs when these are used, against rotation.

In order to form the neck and annular channel for reception of the rigid ring, the edge of the container wall defining the aperture may be moulded back upon itself or, alternatively, the neck may be made as a separate part for bonding to the container wall surrounding and defining the aperture. Thus it will be understood that the invention also includes as a feature a centrally apertured mounting for detachably securing a fitment at an aperture of a flexible liquid container and comprising a resilient ring, suitable for bonding by one face to the external wall of the container surrounding the aperture, having an external annular channel in which is located a rigid ring provided with spaced holes, whose axes are substantially parallel to the ring axis, in each of which one end of a stud or bolt may be passed for securing the fitment in position, the ring preferably being shaped to hold bolt heads or nuts against rotation instead of being threaded as would otherwise be necessary.

Naturally, the invention includes also a flexible liquid container furnished with such mounting arrangements.

Two constructions of mounting will now be described, by way of example only, with reference to the accompanying drawings in which:—

Figure 1 is an elevational section through one embodiment of fitment mounting applied to a flexible container, whilst;

Figure 2 is a similar view of a modified mounting, and

Figure 3 illustrates how the fitment securing bolts may be inserted.

The mounting illustrated in Figure 1 comprises a resilient neck 3 formed by moulding the edge of the container wall material 1 back upon itself to form an exterior annular channel 4 the interior of which is reinforced by a resilient collar 5. A rigid light metal alloy ring 6 is located in the channel 4 and is shaped to hold the heads of fitment-securing bolts 7 against rotation, the bolts being inserted through spaced holes formed through the rigid ring 6 and extremity of the neck 3 in the manner illustrated in Figure 3, by flexing the wall of the container. The bolts 7 are also passed through a reinforcing ring 8 and a filler neck 10, which in this construction constitutes the fitment and has threads 11 for the reception of a filler cap (not shown). and the neck 10 is secured in position by tightening nuts 12.

In the production of such a mounting a hole is cut or punched in the container wall 1 at a location where a fitting has to be attached. The wall 1 may here, if desirable; be reinforced with one or more thickness of plastic or rubber-like material and/or with fabric or fibres, natural or synthetic. A mandrel, expanding or otherwise, or a former, is inserted into the hole and the latter is stretched, with the local application of heat, if necessary, to mould the neck 3. Holes which correspond with those in the rigid ring 6 are then punched in the extremity of the neck 3, and by slightly flexing the neck the ring 6 can be inserted

in the channel 4. In some applications where it is advantageous to bond the ring 6 within the channel 4 the ring is coated with a film of suitable adhesive before being placed and clamped in position.

In the modification shown in Figure 2 the mounting comprises a separate annularly-channelled resilient ring 13 to which the fitment 10 may be secured by means of the bolts 7 through a rigid light metal alloy ring 14, which serves the same purposes as the ring 6, before the mounting is secured around the aperture of the container. Assuming that the container and ring 13 are both made of unvulcanised rubber, the whole mounting and fitment assembly may then be secured to the container by vulcanising in position.

If the nature of the fitment is such that the vulcanising process would damage it, a drilled ring may be substituted for the fitment during vulcanisation, afterwards being replaced by the proper fitment. It will be appreciated that studs and nuts may be substituted for the bolts.

What we claim is:—

1. A fitment mounting to surround an aperture formed in a wall of a flexible liquid-container, in which the aperture externally of the container, is provided with a resilient outstanding neck having an external annular channel in which is located a rigid ring provided with spaced holes whose axes are substantially parallel to the ring axis in each of which one end of a stud or bolt may be secured, the end of the neck remote from the container wall having complementary holes through which the studs or bolts may be passed to secure a fitment in position.

2. A fitment mounting according to claim 1 in which the holes in the rigid ring are plain and the ring is shaped to hold the bolt heads, or nuts at one end of the studs, against rotation.

3. A fitment mounting according to claim 1 or claim 2 in which, in order to form the neck and annular channel for reception of the rigid ring, the edge of the container wall defining the aperture is moulded back upon itself.

4. A centrally apertured mounting for detachably securing a fitment at an aperture of a flexible liquid-container, comprising a resilient ring suitable for bonding by one face to the external wall of the container surrounding the aperture, having an external annular channel in which is located a rigid ring provided with spaced holes whose axes are substantially parallel to the ring axis in each of which one end of a stud or bolt may be secured, the face of the channelled ring remote from that for bonding to the container having holes complementary with those of the rigid ring through which the bolts or studs may be passed for securing the fitment in position.

5. A fitment mounting according to claim 4 in which the holes of the rigid ring are plain and the ring is shaped to hold bolt heads or nuts at one end of the studs against rotation.

6. A flexible fuel tank in which the mountings for fitments at apertures formed in the tank walls are constructed and arranged substantially as described with reference to Figures 1 and 2 of the accompanying drawings.

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PROVISIONAL SPECIFICATION

Improvements relating to Flexible Containers for Liquids and to Fitment Mountings therefor

We, FIREPROOF TANKS LIMITED, a British Company, of Armadores House, Bury Street, London, E.C.2, do hereby declare the nature of this invention to be as follows:—

This invention is concerned with attachments for fittings at the apertures of flexible containers for liquids and may be applied in particular to flexible fuel tanks for air, land and sea borne vehicles. Such tanks are usually made from flexible sheeting of plastic material, natural or synthetic rubber or similar material, either reinforced or not, with woven or like fabric.

The invention is concerned with the attachment of fittings, such for example as inlet and outlet unions, gauge fittings, air vents, inspection covers and the like which are usually formed from rigid material and are preferably detachable and must form leak proof joints with the container.

Hitherto, there have been two accepted methods of fixing such fittings. In the first method the material was clamped around the apertures in the wall of the container, reinforced locally where necessary, between rigid members which are usually flat rings in contact with the

inside and outside of the container wall. The fittings are attached to one of these rings by means of bolts. In the second method, to the walls of the fluid containers, which may be locally reinforced if necessary, is cemented a rigid ring completely or partly embedded in a plastic or rubber-like material. The studs or bolts which locate the fitting have one end located in the ring. Means are provided for replacing the studs or bolts, should they become worn or damaged.

Both of these methods suffer from certain disadvantages. Thus, in the first method, the fact that the sheeting material of which the container is made is plastic or resilient causes that part of the material which is located between the clamping rings to be deformed under pressure and to develop plastic flow, especially under tropical conditions. This will result in leakage near the fittings upon reduction of stress in the joints. Also, the unclamped portion of the flexible material of the container immediately adjacent the clamping rings may tend to chafe or fret due to concentration of stress if the assembly is subjected to vibration or fluctuating loading. Furthermore, with this method of attachment, leakage is apt to arise along the clearance within the threads of the bolts or studs used for clamping, unless great care is taken to replace worn or defective sealing washers under the heads of these bolts or studs. Yet again, should one of the bolts or studs used to secure the fitting break off, it is difficult to remove the broken stud and such repair probably necessitates the removal of the complete clamping rings assembly from the container.

The second method, although an improvement on the first, also suffers from some disadvantages. Thus, the rigid ring which is embedded or moulded in a plastic or rubber-like material is cemented on to the container wall. Should this ring become distorted or otherwise damaged during service, its replacement is a matter of some difficulty and necessitates special equipment such as cements, heat vulcanisers etc. Removing the faulty ring from the container wall may cause damage to the aforesaid container walls. Furthermore, when cementing the moulded ring to the container wall, special clamping devices have to be used so as to secure good adhesion. This is especially the case when the container walls are made from uncured natural or synthetic rubbers and subsequently heat vulcanised. During vulcanisation, rubber has a tendency to shrink and pull away from the moulded ring. Also the moulded rings are liable to be heavy and add considerable weight to liquid containers.

The object of the present invention is to provide a form of attachment for such fittings to flexible containers which obviates the afore-mentioned disadvantages, and thus enables a flexible container to be produced which will remain liquid-tight under adverse conditions of temperature and vibration, permit easy replacement during service of broken or damaged bolts, studs or rigid ring, without the penalty of undue weight or special repair equipment.

According to the invention, a rigid ring drilled to receive bolts or studs and shaped to hold the bolt heads or nuts on the studs against rotation is located within a U-shaped fold of flexible material surrounding the aperture of the container and carried by the container wall. The ring will have smooth edges so as not to cut or cause any other sort of damage to the parts of the liquid container with which it is in contact. If necessary, this rigid ring can be partly or completely moulded or embedded in a plastic or rubber like material.

In the production of the attachment, a small hole is cut or punched in the container wall at a location where a fitting has to be attached. The wall material may, if necessary, be reinforced here with one or more thicknesses of plastic or rubber-like material and/or with fabric or fibres, natural or synthetic. A mandrel, expanding or otherwise, or a former, is inserted into the aforesaid hole and the edges of the latter are stretched, with the local application of heat, if required, until the fold is formed. The faces of the free limb of the fold may now be further reinforced by cementing or otherwise attaching to them a layer or layers of plastic or rubber like material and/or fabric or fibres, natural or synthetic.

Holes which correspond with those in the rigid ring are punched in the free limb of the fold. By slightly flexing the free limb, a channelled ring can be placed in the fold. The other limb of the fold and the adjacent part of the tank wall may then be flexed to permit the insertion of the bolts, the heads of these bolts being finally located in the channel. In some applications where it would be advantageous to bond the fold to the metal ring, the latter can be coated with a film of suitable adhesive before being placed and clamped in position.

The union or other fitting may then be located over the projecting bolts and secured in position by nuts.

It will be appreciated that the con-

struction may be effected in other ways. Thus with a tank of unvulcanised rubber the fold may be made in a separate ring of unvulcanised rubber and the rigid ring inserted within the fold and the external fitment secured to the channelled ring before the folded rubber ring is secured to the tank; the whole attachment and fitment assembly being then secured to the tank by vulcanising it in position.

If the fitment is of such a nature that the vulcanising process would damage it, a second drilled ring may be used as a temporary fitment during the vulcanising process the second drilled ring being removed and the proper fitment substituted after the assembly has been vulcanised in position.

It will be appreciated that in the constructions described above, studs and nuts may be used instead of bolts.

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FIG.1.

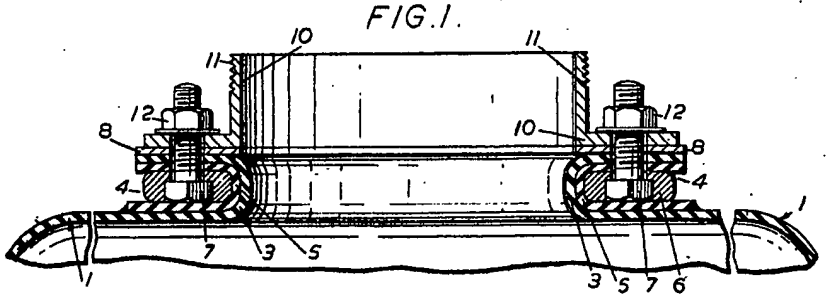


FIG.2.

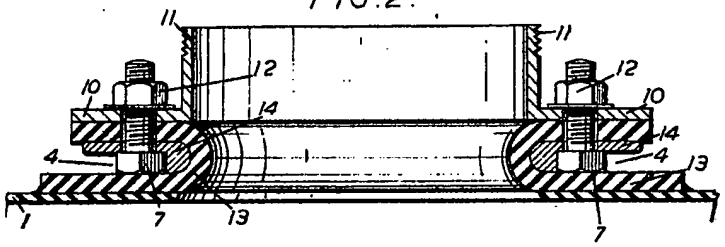
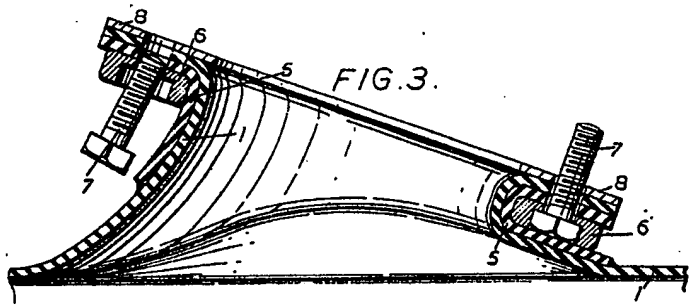


FIG.3.



H.M.S.O. (M.F.P.)